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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/689,409	10/20/2003	Ronald A. Ferrante	02CR239/KE	2553

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Rockwell Collins, Inc.
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EXAMINER

CHU, RANDOLPH I

ART UNIT PAPER NUMBER

2624

DATE MAILED: 12/12/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/689,409

Applicant(s)

FERRANTE ET AL.

Examiner

Randolph Chu

Art Unit

2624

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11/15/2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) _____ is/are rejected.
- 7) ☒ Claim(s) 1-19 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This action is responsive to papers filed on November 6, 2006.

Response to Arguments

2. In response to applicant's amendment received on November 6, 2006, requested changes to the claim have been entered.

Response to Arguments

3. Applicant's arguments filed November 6, 2006 have been fully considered but they are not persuasive.

Applicants argue that the prior art of George does not form an enhancement function or any function to form an enhanced digital image.

The Examiner disagrees, the prior art of George does disclose an enhancement function $\frac{U_2}{U_2^{(r)}} \times U_1^{(r)}$ (Fig.8 ref label 56). Where $U_1^{(r)}$ is data signal from reference image and $U_2^{(r)}$ is data signal from degraded reference image and they are forming enhancement function. U_2 (data signal from degraded unknown image) is applied to enhancement function to form an enhanced image.

Claim Rejections - 35 USC § 102

Art Unit: 2624

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1,2, 5-8, 11, 13, 14, 17 and 19 are rejected under 35 U.S.C. 102(b) as being anticipated by US Patent 6,459,818 to George.

For Claim 1, George discloses, a method of enhancing the quality of a new digital image comprising:

receiving a reference digital image (Fig. 8, Stored Reference Image; Fig. 3A; col. 4 lines 36-40);

receiving a degraded version of the reference digital image (Fig. 8, Degraded Reference Image; Fig. 5A)

deconvolving the reference digital image with the degraded version of the reference digital image to form an enhancement function (Fig. 8, Ref Label 56; col. 5 line 18 – col. 6 line 9);

receiving the new digital image (Fig. 8, Degraded Unknown Image);

applying the enhancement function to the new digital image to form an enhanced digital image (Fig. 8, Ref Label 56); and

making available the enhanced digital image (Fig. 1A, Ref Label 22);.

Art Unit: 2624

For Claim 2, George discloses, deconvolving the reference digital image with the degraded version of the reference digital image comprises:

computing a two-dimensional transform of the reference digital image (Fig. 8, Ref Label 54);

computing a two-dimensional transform of the degraded version of the reference digital image (Fig. 8, Ref Label 50);

dividing the two-dimensional transform of the reference digital image by the two-dimensional transform of the degraded version of the reference digital image to form a two-dimensional quotient (Fig. 8, Ref Label 56), and

computing a two-dimensional inverse transform of the two-dimensional quotient (Fig. 8, Ref Label 58).

For Claim 5, George discloses, receiving the new digital image comprises transferring the new digital image from a digital camera (col. 4 lines 36-40).

For Claim 6, George discloses, applying an enhancement function comprises: representing the enhancement function as a digital filter (col. 5 line 46 – col. 6 line 9);

applying the new digital image to the input of the digital filter; and

computing the output of the digital filter (Fig. 8 ref label 56).

For Claim 7, George discloses, an apparatus for enhancing the quality of a new digital image comprising:

image receiving unit that receives a digital image (Fig. 1A, 12; col. 4 lines 36-40);
supervisor capable of causing the image receiving unit to receive a reference digital image, a degraded version of the reference digital image and a new digital image (Fig. 1A, ref. label 20; Fig 8);

deconvolution unit that deconvolves the reference digital image with the degraded version of the reference digital image to form an enhancement function (Fig. 8, ref. label 56);

enhancement application unit that applies the enhancement function to the new digital image to form an enhanced digital image (Fig. 8, ref. label 56); and

conveyance unit that makes available the enhanced digital image (Fig. 1A, 22).

For Claim 8, George discloses, the deconvolution unit comprises:

two-dimensional transform computing unit capable of computing a two-dimensional transform (Fig. 8, Ref Label 50, 52 and 54); and

two-dimensional complex arithmetic unit capable of dividing a first two-dimensional transform by a second two-dimensional transform (Fig. 8, Ref Label 56);.

For Claim 11, George discloses, the image receiving unit comprises an interface to a digital camera (col. 4 lines 36-40).

For Claim 13, George discloses, an image quality enhancement computer comprising:

- memory capable of storing instructions (Fig. 1A, ref. Label 24);
- processor capable of executing instruction sequences (Fig. 1A, ref. Label 20);
- image receiver capable of receiving a digital image and of passing the digital image to the processor (Fig. 1A, ref. Label 12);

- image processing instruction sequences stored in the memory, said image processing instruction sequences comprising:

- deconvolution instruction sequence that, when executed by the processor, minimally causes the processor to:

- accept a first digital image from the image receiver (Fig. 8, stored reference image),

- accept a degraded version of the first image from the image receiver (Fig. 8, degraded reference image); and

- form an enhancement function by deconvolving the first digital image with the degraded version of the first digital image, and enhancement instruction sequence that, when executed by the processor (Fig. 8, ref. label 56), minimally causes the processor to:

- receive an un-enhanced digital image from the image receiver (Fig. 8, degraded unknown image); and

form an enhanced digital image by applying the enhancement function to an un-enhanced digital image (Fig. 8, ref. label 56),; and conveyance interface capable of providing the enhanced digital image (Fig. 1A, ref. Label 22).

For Claim 14, George discloses, the memory (Fig. 1A, ref. Label 24) further has stored therein a two-dimensional transform instruction sequence that, when executed by the processor, minimally causes the processor to perform a two-dimensional transform and wherein the processor comprises an arithmetic unit capable of dividing a first two-dimensional transform by a second two-dimensional transform (Fig. 8).

For Claim 17, George discloses, the image receiver comprises a digital camera interface capable of receiving a digital image transferred from a digital camera (Fig. 1A, ref. Label 12; col. 4 lines 36-40).

For Claim 19, George discloses, the image processing instruction sequences further comprise:

two-dimensional transform instruction sequence that, when executed by the processor, minimally causes the processor to perform a two-dimensional transform and wherein the processor comprises an arithmetic unit capable of computing the product of a first two-dimensional transform and a second two-dimensional transform (Fig. 8).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 3, 9 and 15 are rejected under 35 USC 103(a) as being unpatentable over George (US Patent 6,459,818) in view of Tsujita (US Patent 5,879,284)

George discloses all the limitations of claims 1, 7 and 13 as applied above from which claims 3, 9, and 15 respectively depend.

George does not disclose expressly that computing a least-squares deconvolution of images.

Tsujita discloses a least square filter (wiener filter reverse convolution filter) (col. 3, lines 29-34).

George and Tsujita are analogous art because they are in the "same field of endeavor", image processing that enhancing degrade image using deconvolution filter (reverse convolution filter).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use a least-squares deconvolution filter in the method and apparatus of George.

The suggestion/motivation for doing so would have been to minimize the mean square error between original image and restored image. (Tsujita, col. 3, lines 29-34)

Therefore, it would have been obvious to combine Tsujita with George to obtain the invention as specified in claims 3, 9 and 15.

8. Claims 4, 10 and 16 are rejected under 35 USC 103(a) as being unpatentable over George (US Patent 6,459,818) in view of Acharya (US Patent 6,108,453)

George discloses all the limitations of claims 1, 7 and 13 as applied above from which claims 4, 10, and 16 respectively depend.

George does not disclose expressly that combining the first and second degraded versions of the reference digital image to form an average degraded version of the reference digital image.

Acharya discloses average on the input image (col. 2, lines 13-28).

George and Acharya are analogous art because they are in the "same field of endeavor", image processing that enhancement of image.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to average the input images in the method and apparatus of George.

The suggestion/motivation for doing so would have been to generate a smoother (less jogged) version of the input image (Acharya, col. 2, lines 13-28).

Therefore, it would have been obvious to combine Acharya with George to obtain the invention as specified in claims 4, 10 and 16.

9. Claims 12 and 18 are rejected under 35 USC 103(a) as being unpatentable over George (US Patent 6,459,818) in view of Ishihara et al. (US Patent 5,390,264).

George discloses all the limitations of claims 2 and 18 except, unit-sample response coefficient table. George discloses digital filter unit-sample response coefficient that represents the enhancement function, but not in table.

Ishihara et al. discloses enhancement coefficient table memory sing a function (col. 4 lines 10-23).

George and Ishihara et al. are analogous art because they are in the "same field of endeavor", image processing that enhancement of image.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use unit-sample response coefficient table when enhancing the images in the method and apparatus of George.

The suggestion/motivation for doing so would have been that digital filter unit-sample response coefficient that represents the enhancement function is prepared and stored in table so that enhancement procedure can be quicker (Ishihara et al., col. 4 lines 39-51).

Therefore, it would have been obvious to combine Ishihara et al. with George to obtain the invention as specified in claims 12 and 18.

Conclusion

10. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Randolph Chu whose telephone number is 571-270-1145. The examiner can normally be reached on Monday to Thursday from 7:30 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph Mancuso can be reached on 571-272-7695. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For

Art Unit: 2624

more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

RIC/



JOSEPH MANCUSO
SUPERVISORY PATENT EXAMINER